POS 513 Weekly Science Report (15/05/17 to 21/05/17)

Armin Freundt and Scientific Party POS 513

This week we covered the region between Santorini and Nisyros. On Monday, May 15, after another trial in the morning we terminated the box corer deployments and returned to the gravity corer with trigger system, because the young sediments on the seafloor are apparently mostly too thick to penetrate even the barely 400 years old Columbo tephra immediately east of Santorini. Even with the gravity corer, however, we only got 60-80 cm long cores within 10-20 km distance east of the island, mostly not enough to penetrate the base of the Columbo tephra. Further east, beyond the island of Anafi, however, recovery increased to around 3 m at two stations. The Minoan tephra in this region is either absent or one of the few thin inconspicous ash beds that we will analyze after the cruise. However, here we encountered a layer of black, mafic lapilli for the first time.
Compared to the simple gravity corer, lowering outboard and hauling inboard of the corer equipped with the trigger system takes much more effort but the deck crew has quickly adapted to an efficient work flow; they even improved the corer uplift rack to better capture the weight!

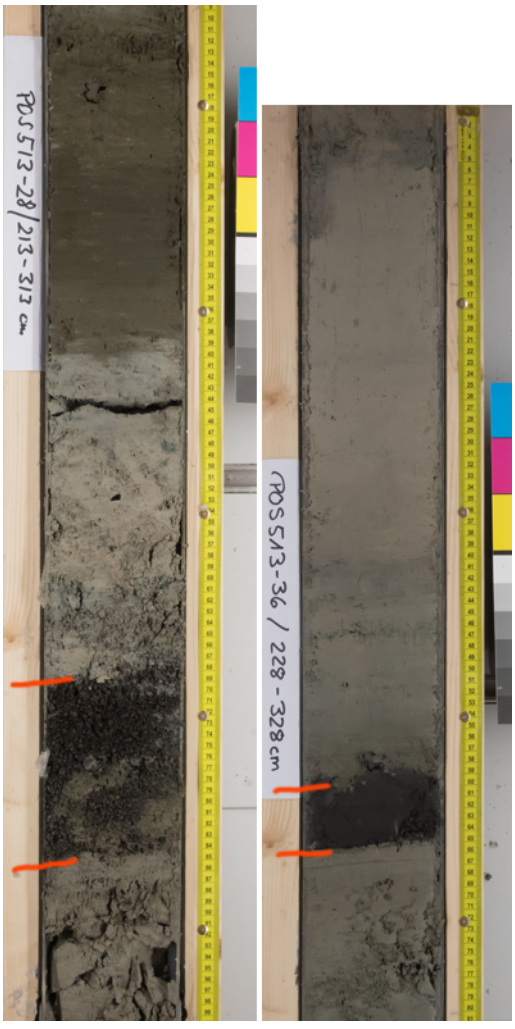

Fig. 1: The black lapilli layer (left) and the black ash layer (right) lie at the same depth below seafloor but 45 km apart. This seems to be a mafic fallout that thickens and coarsens toward Santorini.

May 16 took us northeastward along three stations to the north of Astipalea, an island named after its butterfly shape; all cores here reached 4 to 5 m length but, apparently due to high sedimentation rates, we mainly sampled the young Columbo and Minoan tephras with few traces of ash below.
May 17 we completed the circle around Astipalea by turning southeastward along three stations which gave 3.5 to 4.5 m long cores. At about 3 m below seafloor, we found a black mafic ash layer, that we found again in other cores the next day, and that we tentatively correlate with the black lapilli layer recovered on May 15. If we can later verify these correlations, we may have discovered the first “basaltic” plinian fallout in the Aegean, probably erupted on Santorini as indicated by the direction of thickening and coarsening of this layer (Fig. 1).
60 km further south, near the north rim of the deep basin northeast of Crete, we succeeded in pulling three 5-6 m long cores with the 10 m corer tube on May 18. We found the known layers of the Minoan and the black ash again, as well as an older thick fine ash bed that we probably met again the next day in a different facies (appearance).
May 19 proved particularly successful while using the 10 m corer the whole day. The four stations between Syrna and Nisyros

yielded cores from 3.2 to 6.5 m length with the well-developed Minoan ash about 80 cm below seafloor. One core contains an unusually coarse pumice lapilli layer which, considering proximity to the island, probably derived from Nisyros. The possible equivalent of the thick fine ash from the day before is a 40 cm thick pile of at least 8 thin ash turbidites at about 5 m below seafloor. A highlight of the day came with the last core: a 10 cm thick ash bed stuffed full with accretionary lapilli (tiny aggregated ash balls) that were previously known only from land.

Fig. 2: Night time impression from a bathymetric mapping traject. Photo by Nico Augustin.

The nights from Monday through Friday were again dedicated to bathymetric mapping (Fig. 2). We investigated the structure of island basements and the arrangements of faults (such as the Syrna fault zone) near the islands of Astipalea, Zaphoras and Syrna (Fig.3).

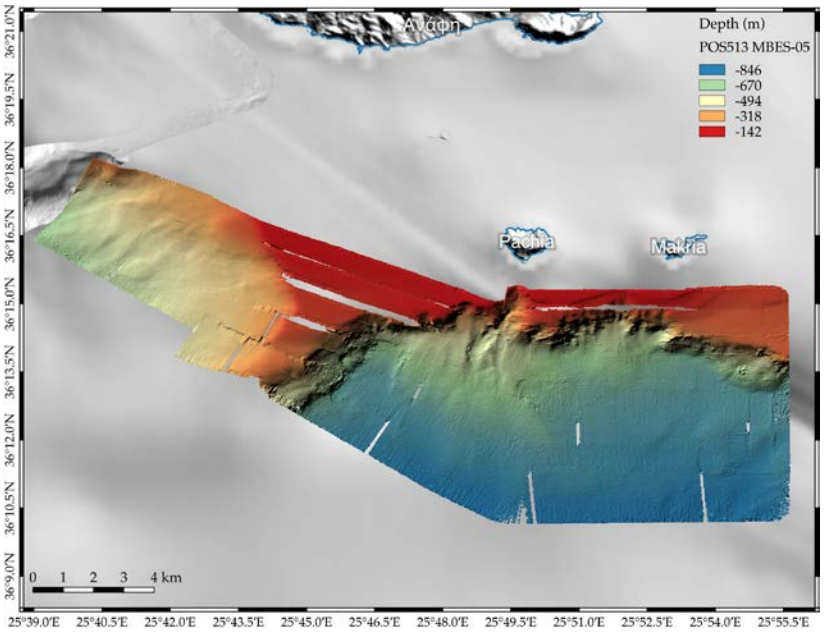

Fig. 3: Bathymetric map of the seafloor south of Anafi showing a fault-controlled cliff.

Strong winds and swell did not allow us to continue mapping over night and we also skipped the first two stations on May 20. At noon the EUA observer disembarked to a shuttle boat that took him to Kos; his early leave had required intense communications with several administrations in order to get the permissions for his departure as well as to continue our work without him. The afternoon with improved weather conditions in the shadow of Kos north of Nisyros rewarded us with a 3.8 m core containing numerous thin ash beds in the sediment profile, probably the traces of smaller post-caldera eruptions on Nisyros. In the second core, east of Nisyros, these were largely absent. We then returned to one of the stations missed in the morning and recovered a 4.2 m core with several ash and fine pumice lapilli horizons and an impressive >60 cm thick pumice lapilli deposit and the base, which probably is the 47 ka Upper Nisyros Pumice from the caldera-forming eruption. Contrary to earlier warning of a military exercise near the Greek-Turkish border we have not encountered any navy vessels here.

Sunday, May 21, we completed the circle around Nisyros-Yali. The four cores with 2.3 to 5.6 m recovery contained several pumice-bearing ash layers which we tentatively relate to Nisyros eruptions.

Everybody on board is happy with the work progress and the relaxed atmosphere, and with the improved weather conditions we are certain to successfully conclude the work program within the last to days to come.